

REMARKS

Claims 1-6 and 8-16 have been amended. Claims 7 has been cancelled without prejudice or disclaimer. Claims 17-22 are new added. Claims 1-6 and 8-22 are pending.

Applicants have thoroughly reviewed the outstanding Office Action including the Examiner's remarks and the references cited therein. The following remarks are believed to be fully responsive to the Office Action and, when coupled with the above amendments, are believed to render all claims at issue patentably distinguishable over the cited references.

Applicants respectfully requests reconsideration in light of the following remarks.

CLAIMS OBJECTION

With respect to page 2 of the Office Action, the Examiner objected to the claims because of the occurrences of non-grammatical or non-idiomatic English.

Applicants have amended the claims to remove the non-grammatical or non-idiomatic English. Withdrawal of the objection is requested.

CLAIM REJECTION-35 U.S.C. SECTION 112 second paragraph

Claims 1-16 are rejected under 35 U.S.C. 112 second paragraphs as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In the rejection, the preamble of each of claims 1, 8, and 14, particularly the phrase "vapor liquid delivery system", is said to be unclear. The rejection alleges that the disclosed apparatus is a "vapor delivery system". This is incorrect. The "vapor liquid delivery system" language is disclosed at page 1, lines 8-9, and page 2, lines 16. Therefore, Applicant's specification does disclose a vapor liquid delivery system.

In addition, the phrase "heating liquid injection apparatus" lacks proper antecedent basis because line 1 of claim 8 only recites a "heating injection apparatus". Applicants have replaced "heating liquid injection apparatus" with -- heating injection apparatus-- in claims 9-13.

Additional corrections have been made to the claims to improve their form.

Withdrawal of the rejection is requested.

CLAIM REJECTION-35 U.S.C. SECTION 112 first paragraph

Claims 4, 7, 10-12, and 14-16 are rejected under 35 U.S.C. 112 first paragraphs as failing to comply with the enablement requirement.

The rejection alleges that the material TMCTS is disclosed as being used as the liquid source material to be atomized, but the specification does not disclose a step of using TMCTS as the carrier gas in the manner recited in claims 4, 7, 12, and 16.

Applicants have amended claims 4, 12 and 16 by changing “carrier gas” to “liquid source”. Claim 7 has been canceled.

Withdrawal of the rejection is requested.

CLAIM REJECTION-35 U.S.C. SECTION 102(e)/103(a)

Claims 1-4 are rejected as anticipated under 35 U.S.C. 102(e) by or, in the alternative, under 35 U.S.C. 103 (a) as obvious over, Sun (U.S. Patent No. 6,409,839).

Sun discloses a vapor generator and connected chemical vapor deposition chamber for providing a vapor for operations such as chemical vapor deposition. The disclosed apparatus has an atomizer for forming an aerosol or droplet spray separate from a vaporization chamber (Abstract). Sun also discloses a vaporizer that uses an aerosol generator that atomizes a liquid into small and larger droplets carried in a gas stream at substantially room temperature (see, e.g., col. 2, line 67 to col. 3, line 2). Sun also discloses a device to produce a source of a gas stream carrying a vapor of a selected reagent therein (see, e.g., claim 1).

Sun does not disclose a “purging gas provider” as recited in claim 1. Claim 1, as amended, recites “a purging gas provider providing a purging gas to purge out said liquid source that remains inside said liquid injector”. In contrast, Sun discloses that the solvent is sprayed under pressure into the heated vaporizer to wash out the build up of residue in the passageways and also in the vaporizer. In other words, the solvent will go into the passageway and will be carried in a gas jet into the interior of the chamber section forming the vaporizer to rinse down and clean the wall surface (see, e.g., col. 6, lines 52-58, and FIG. 7). Sun merely discloses that the wall surface is cleaned by the solvent, but does not disclose the “purging gas provider providing a purging gas to purge out said liquid source...”.

Thus, Sun does not disclose or suggest the “purging gas provider” as recited in claim 1.

Furthermore, claim 1 also recites “an exhausting branch adjacent said liquid injector, and said exhausting branch exhausting redundant said liquid source that is purged by a purging gas”. Sun discloses that the liquid source is to be atomized by an atomizer, but does not disclose or suggest an exhausting branch exhausting redundant liquid source.

Therefore, Sun does not anticipate, or render obvious, claim 1. Claims 2-4 depend from claim 1 and are patentable along with claim 1 and need not be separately distinguished at this time. By not separately addressing claims 2-4, Applicants do not concede the propriety of the rejections thereto, and Applicants reserve the right to file arguments at a later date addressing claims 2-4.

CLAIM REJECTION-35 U.S.C. SECTION 102(b)/103(a)

Claims 1-4, 8-9, and 12 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious, over Sturm (U.S. Patent No. 6,178,925).

Sturm discloses a liquid delivery apparatus for vaporizing a liquid to produce a vapor therefrom. A liquid feed assembly is provided that includes (i) a liquid source and (ii) a liquid flow circuit coupled to the liquid source and arranged to discharge liquid onto the vaporizer surface during liquid vaporization operation. Sturm also discloses a pressurized gas source that is arranged to introduce a clearance burst of pressurized gas into the liquid flow circuit after completion of the liquid vaporization operation, so that hold-up liquid in the liquid flow circuit and/or vaporizer following completion of the liquid vaporization operation is discharged onto the vaporizer surface and vaporized (see, e.g., the Abstract).

Sturm discloses that the liquid from the liquid source is flowed through lines 36 and 26 to the flow path 34 and then flowed through line 22 and the lower, heated portion 76 of line 22 to the vaporizer surface of vaporizer element 16 (see, e.g., Fig. 1). In the second position, the pressurized gas from gas source 40 is flowed through lines 42 and 38 through flow path 36 and through line 22 to the lower, heated portion 76 of line 22 “to burst purge the line of any residue liquid contained therein” after the completion of the active deposition operation (col. 5, lines 53-61). In addition, Sturm also discloses an optional regeneration step that may include a burst purge voiding of the hold-up liquid in the liquid delivery line 22 by pressurized gas from the pressurized gas source 40, as well as a cleaning of the interior surface of the vaporization chamber 14, and the vaporizer element 16 by a solvent medium or other cleaning fluid,

introduced from cleaning fluid source 68 and flowed through line 70 to the manifold pipe 72 equipped with spray nozzle heads 74.

Claim 1 recites a liquid injection module that comprises the following: “a purging gas provider providing a purging gas to purge out said liquid source that remains inside said liquid injector”; “a first three-way valve located between said liquid source, said purging gas provider and said liquid injector”; and “an exhausting branch adjacent said liquid injector, and said exhausting branch exhausting redundant said liquid source that is purged by a purging gas”.

Claim 8 recites similar features.

Sturm does not disclose a purging gas provider as claimed. In the disclosure of Sturm, the “pressurized gas from the pressurized gas source as well as a cleaning of the interior surface of the vaporization chamber”, and “the vaporizer element by a solvent medium or other cleaning fluid, introduced from cleaning fluid source and flowed through line to the manifold pipe...”, are not equivalent to the claimed purging gas provider. The purpose of the purging gas is to purge out the liquid source that remains inside the liquid injector; the purging gas is not to clean the surface of the vaporization chamber.

In addition, Sturm does not disclose the claimed relationship of the three-way valve and the liquid source, the purging gas provider and the liquid injector. Referring to FIG. 1 of Sturm, the three-way valve 24 is connected between the liquid delivery line 22, liquid feed line, and pressurized gas feed line 38. The valve 24 of Sturm is not located between a liquid source, a purging gas provider, and a liquid injector, as recited in claims 1 and 8.

Therefore, Sturm does not anticipate, or render obvious, claims 1 and 8. Claims 2-4 depend from claim 1, while claims 9 and 12 depend from claim 8. The dependent claims are patentable along with claims 1 and 8 and need not be separately distinguished at this time. By not separately addressing dependent claims 2-4, 9 and 12, Applicants do not concede the propriety of the rejections thereto, and Applicants reserve the right to file arguments at a later date addressing claims 2-4, 9 and 12.

CLAIM REJECTION-35 U.S.C. SECTION 103(a)

Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Noguchi (JP 2001-250819) taken in view of Lei (US 2003/0049933) and further in view of Sun ('839) and/or Sturm.

Noguchi relates to vapor-growth equipment which forms an oxide film on a substrate front face, and discloses that the ozone and the gas of the organic source react by CVD. The source liquid material is evaporated within the carburetor 20-22. The source gas which each source liquid material is evaporated and is obtained within the carburetor 20-22 is introduced into a reactor 23-35 of the gas supply unit 62 (paragraph 5, lines 1-4 and FIG. 8). In addition, Noguchi also discloses a flow regulator 14 that is for adjusting the flow rate of N₂ gas introduced into a reaction chamber 1 as purge gas (paragraph 6, lines 5-6).

Lei discloses a gas panel that includes a purge gas inlet and a waste outlet in communication with forelines of the semiconductor processing tools, such that vaporizer, flowmeter, and gas/liquid handling line components of the gas panel can periodically be effectively purged without contaminating other elements of the gas panel (see, e.g., Abstract). Lei also discloses that once liquid TDMAT has been homogeneously converted to the gas phase in vaporizer 184, the atomized TDMAT is flowed through superheater structure 187 and uniformly heated to maintain homogeneity of its vapor phase. Gaseous TDMAT is then flowed through three-way valve 188 to TDMAT outlet port 190 of gas panel.

Claim 1 recites a liquid injection module comprising “a purging gas provider providing a purging gas to purge out said liquid source that remains inside said liquid injector”; “a first three-way valve located between said liquid source, said purging gas provider, and said liquid injector”; and “an exhausting branch adjacent said liquid injector, and said exhausting branch exhausting redundant said liquid source that is purged by a purging gas”.

The proposed combination of references does not disclose the purging gas provider as claimed. Furthermore, the claimed relationship between the three-way valve and the liquid source, the purging gas provider and the liquid injector is also not taught or suggested by the proposed combination. In the proposed combination of references, none of the references disclose the three-way valve as being connected TDMAT outlet port, which is not located between the purging gas provider and the liquid injector.

Therefore, claim 1 is patentable over Noguchi, Lei, Sun and/or Sturm. Claims 2-4 depend from claim 1, and are patentable along with claim 1 and need not be separately distinguished at this time. By not separately addressing claims 2-4, Applicants do not concede the propriety of the rejections thereto, and Applicants reserve the right to file arguments at a later date addressing claims 2-4.

Claims 5-9 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Noguchi taken in view of Lei and further in view of Sun ('839) and/or Sturm, for the reasons stated in the previous paragraph rejection, and further taken in view of Yamamuka ('283).

Yamamuka et al discloses a chemical vapor deposition apparatus to reduce generation of contaminants such as residues within the apparatus can be obtained (see, e.g., Abstract). Yamamuka et al discloses a pipe heater 33 that is provided to a source transport pipe 17 connecting vaporizer 5 with a mixer portion 7. A vent line 52 is further provided to source transport pipe 17 for discharging any unnecessary CVD source at the purging or the like (col. 7, lines 31-33).

The proposed combination does not disclose a purging gas provider as recited in claim 8. In Yamamuka et al., the vent line 52 is provided to source transport pipe 17 for discharging any unnecessary CVD source at the purging or the like. However, as claimed, the purging gas is used to purge out the liquid source. The purging gas is not used to discharge any unnecessary CVD source. Thus, the purpose and use of purging gas provider is different between the claims and the proposed combination. Moreover, the proposed combination does not disclose the three-way valve as recited in claim 8.

Therefore, claim 8 is patentable over Noguchi, Lei, Sun and/or Sturm, and Yamamuka. Claims 9 and 13 depend from claim 8, and are patentable along with claim 8 and need not be separately distinguished at this time. By not separately addressing claims 9 and 13, Applicants do not concede the propriety of the rejections thereto, and Applicants reserve the right to file arguments at a later date addressing claims 9 and 13.

It is to be noted that claims 5-6 depend from claim 1 which is patentable for the reasons discussed above. Claims 5-6 need not be separately distinguished at this time. By not separately addressing claims 5-6, Applicants do not concede the propriety of the rejections thereto, and Applicants reserve the right to file arguments at a later date addressing claims 5-6.

Claims 10-11 and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Noguchi taken in view of Lei, Sun and/or Sturm, Yamamuka, and Ewing.

The proposed combination does not disclose a purging gas provider as recited in claim 14. Noguchi, Lei, Sun, Sturm, and Yamamuka et al. do not teach the claimed purging gas provider as discussed above. Ewing is not relied upon to teach a purging gas provider and does

not teach the claimed purging gas provider. Moreover, the proposed combination does not disclose the first and second three-way valves as recited in claim 14.

Therefore, claim 14 is patentable over Noguchi, Lei, Sun and/or Sturm, Yamamuka, and Ewing. Claims 15-16 depend from claim 14, and are patentable along with claim 14 and need not be separately distinguished at this time. By not separately addressing claims 15-16, Applicants do not concede the propriety of the rejections thereto, and Applicants reserve the right to file arguments at a later date addressing claims 15-16.

It is to be noted that claims 10-11 depend from claim 8 which is patentable for the reasons discussed above. Claims 10-11 need not be separately distinguished at this time. By not separately addressing claims 10-11, Applicants do not concede the propriety of the rejections thereto, and Applicants reserve the right to file arguments at a later date addressing claims 10-11.

Claims 8, 9, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Noguchi taken in view of Lei, Sun and/or Sturm, Yamamuka, and Nagashima, Chen and Kanishak.

The proposed combination does not disclose a purging gas provider as recited in claim 8. Noguchi, Lei, Sun, Sturm, and Yamamuka et al. do not teach the claimed purging gas provider as discussed above. Nagashima, Chen, and Kanishak are not relied upon to teach a purging gas provider and do not teach the claimed purging gas provider. Moreover, the proposed combination does not disclose the three-way valve as recited in claim 8 as discussed above.

Therefore, claim 8 is patentable over Noguchi, Lei, Sun and/or Sturm, Yamamuka, and Nagashima, Chen, and Kanishak. Claims 9, 12, and 13 depend from claim 8, and are patentable along with claim 8 and need not be separately distinguished at this time. By not separately addressing claims 9, 12, and 13, Applicants do not concede the propriety of the rejections thereto, and Applicants reserve the right to file arguments at a later date addressing claims 9, 12 and 13.

New claims 17-22 are also patentable over the cited prior art of record.

Conclusion

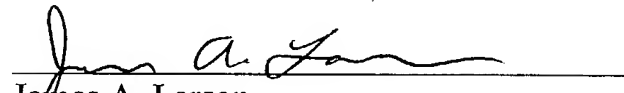
In the light of the above amendments and remarks, Applicant respectfully submits that all pending claims 1-6 and 8-22 are in condition for allowance. Accordingly, reconsideration is respectfully requested. If there are any remaining issues to be resolved, the Examiner is

welcome to contact the undersigned at the number provided below in order to discuss the application.

Respectfully submitted,

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